APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/813,437	03/31/2004	Kirti Srivastava	4062-115	3807

			EXAMINER
23117	7590	03/22/2005	DOUGHERTY, ANTHONY T

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ART UNIT	PAPER NUMBER
2863	

DATE MAILED: 03/22/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE _3_ MONTH(S) FROM
THE MAILING DATE OF THIS COMMUNICATION.
- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed
  after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
  Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any
  earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on _30 June 2004_.

2a)☐ This action is **FINAL**.   2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is
closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) _1-7_ is/are pending in the application.

    4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) _1-7_ is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on _30 June 2004_ is/are: a)☒ accepted or b)☐ objected to by the Examiner.

    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

    Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a)☐ All   b)☐ Some * c)☐ None of:

      1.☐ Certified copies of the priority documents have been received.

      2.☐ Certified copies of the priority documents have been received in Application No. _____.

      3.☐ Copies of the certified copies of the priority documents have been received in this National Stage
application from the International Bureau (PCT Rule 17.2(a)).

    * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1)☒ Notice of References Cited (PTO-892)

2)☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3)☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
    Paper No(s)/Mail Date _____.

4)☐ Interview Summary (PTO-413)
    Paper No(s)/Mail Date. _____.

5)☐ Notice of Informal Patent Application (PTO-152)

6)☐ Other: _____.

DETAILED ACTION

Claim Objections

1.   Claim 1 objected to because of the following informalities: Claim 1 recites the limitation

"$K(z) = \overline{K} + K'(z)$ is the thermal conductivity" in line 9. There is insufficient antecedent basis

for this limitation in the claim. It is assumed by the examiner that this is a typographical error in

line 5 of claim 1 which reads:

$$ \text{``} \frac{d}{dz} \left\{ \left(\overline{K} + K'(z) \right) \frac{dT}{dz} \right\} = -A(z) \text{''} $$

and therefore line 5 of claim has been treated for examination purposes with respect to the prior

art as if it reads

$$ \text{``} \frac{d}{dz} \left\{ K(z) \frac{dT}{dz} \right\} = -A(z) \text{''} $$

instead. Appropriate correction is required.

2.   Claim 1 objected to because of the following informalities: Line 16 recites the limitation

"σ_K^2 is the variance *is* thermal", (emphasis added) it is believed by the examiner that this is a

typographical error and for clarity has been treated for examination purposes with respect to the

prior art as if it reads "σ_K^2 is the variance *in* thermal" (emphasis added for identification of error

only). Appropriate correction is required.

Claim Rejections - 35 USC § 102

3.   The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the

basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4.   Claims 1-7 rejected under 35 U.S.C. 102(b) as being anticipated by Research Note "A

stochastic model to quantify the steady-state crustal geotherms subject to uncertainties in thermal

conductivity" Kirti Srivastava and R.N. Singh Geophysical journal International (1999) Volume

138, pp. 895-899 (hereinafter Srivastava et al.).

With regard to claim 1 Srivastava et al. discloses a method for obtaining closed form

expressions for subsurface temperature depth distribution along with its error bounds (see

Summary) by using a stochastic heat conduction equation (see column 3 line 28-31),

incorporating random thermal conductivity (see column 3 line 31-34), to obtain a mean and

variance in temperature fields for a set of boundary conditions (see column 3 line 34-37), the

equation consisting of:

$$\frac{d}{dz}\left\{K(z)\frac{dT}{dz}\right\} = -A(z) \quad \text{(see column 3 line 45 equation 1)},$$

where T is the temperature (°C) (see column 3 line 49), A(z) is the radiogenic heat source

(uW/m^3) (see column 3 line 50), $K(z) = \overline{K} + K'(z)$ is the thermal conductivity (w/m°C) (see

column 4 line 3 equation 4), which is expressed as a sum of a deterministic component and a

random component (see column 4 line 1-5), K'(z) is the random component with mean zero and

a Gaussian colored noise correlation structure represented by

$$E(\,K'(z)\,) = 0$$

$$E(\,K'(z_1)\,K'(z_2)\,) = \sigma_K^2 e^{-p|z_1-z_2|}\,\sigma$$

(see column 4 line 5-10 equations 5 and 6), where

σ_K^2 is the variance in thermal conductivity $(W/m\ ^\circ C)^2$

p is the correlation decay parameter m^{-1} (or $1/p$ is the correlation length scale) and z_1 and z_2 are

depths (m) (see column 4 line 11-15).

With regard to claim 2, and applying the rejection of claim 1 above, Srivastava et al.

discloses the boundary conditions consists of condition of heat sources and is selected from the

group consisting of Zero $(A(z) = 0)$, Constant $(A(z) = A)$ and exponentially decreasing with

depth ($A(z) = A_0 e^{-z/D}$) (see column 1 line 8-11 & column 6 line 25-26).

With regard to claim 3 and applying the rejection of claim 1 above, Srivastava et al.

discloses the boundary condition comprises constant surface temperature and constant surface

heat flow (see column 1 line 8-11 & column 6 line 25-26).

With regard to claim 4, and applying the rejection of claim 1 above, Srivastava et al.

discloses the boundary condition comprises constant surface temperature and constant basal heat

flow (see column 1 line 8-11 & column 6 line 25-26).

With regard to claim 5, and applying the rejection of claim 1 above, Srivastava et al.

discloses a parameter used is that of radiogenic heat generation (see column 3 line 50).

With regard to claim 6, and applying the rejection of claim 1 above, Srivastava et al.

discloses the method is carried out electronically using a computing means with appropriate

numerical values given for controlling thermal parameters, computing and plotting the mean and

error bounds on the temperature depth distribution (see column 6 line 40-56 and Figures 1 and

2).

With regard to claim 7, and applying the rejection of claim 1 above, Srivastava et al.

discloses the subsurface is selected from an oil field, a natural gas field, tectonically active area

and a mineral resource area (see Summary & column 1 line 1-8 & column 3 line 1-5).

Conclusion

5.   The prior art made of record and not relied upon is considered pertinent to applicant's

disclosure.

U.S. Patent Application Publication No. US 2004/0243311 A1 to Srivastava et al.

because it teaches obtaining the analytical closed form solution to mean and variance in heat

flow by solving the stochastic heat conduction equation incorporating randomness in thermal

conductivity but is not applicable as prior art due to filing dates.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Anthony T. Dougherty whose telephone number is (571) 272-2273. The examiner can normally be reached on Monday through Friday from 8 to 5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John E. Barlow can be reached on (571) 272-2269. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

atd

MICHAEL NGHIEM
PRIMARY EXAMINER

3/16/05